Refractory Metal/Silicide Multiphase Systems for High –Temperature Structural Applications

M.G. Mendiratta, S.K. Menon, and T.A. Parthasarathy

UES Inc., 4401 Dayton-Xenia Rd., Dayton; Ohio 45432-1894

Alloys within the two systems Mo-Si-B and Nb-Ti-Cr-Si-X (X=Hf, Al, Sn) are currently being explored as high temperature structural materials for jet engines. The goal of this research is to develop materials with temperature capability significantly exceeding that of the best current Ni-base superalloys thus leading to higher engine thurst and higher structural efficiency. These multiphase alloys consist mainly of i) a solid solution refractory metal phase which provides some degree of resistance to fracture and ii) silicide and other intermetallic phases responsible for high temperature oxidation and creep resistance. This presentation is an overview of the progress made on these systems through continuing research at AFRL/UES and other organizations. The focus will be on composition selection, processing, microstructural evolution, oxidation behavior and mechanical properties. The processing methods consist of ingot casting, powder metallurgy and hot extrustion. Cyclic oxidation experiments have been carried out from 600-1350°C. Tensile, compressive, fatigue, toughness, and creep properties have been determined from RT-1400°C. These properties and failure mechanisms will be discussed and compared for the two systems. Venues for further research will also be presented.

Contact Author: Madan G. Mendiratta
Organization: UES Inc. (AFRL/MLLM)
Address: 4401 Dayton-Xenia Rd., Dayton; Ohio 45432-1894
Phone: 937/255-9832
Fax: 937/656-7292
E-mail: madan.mendiratta@wpafb.af.mil

Author: Sarath K. Menon
Organization: UES Inc. (AFRL/MLLM)
Address: 4401 Dayton-Xenia Rd., Dayton; Ohio 45432-1894
Phone: 937/255-9835
Fax: 937/656-7292
E-mail: sarath.menon@wpafb.af.mil

Author: Triplicane A. Parthasarathy
Organization: UES Inc. (AFRL/MLLM)
Address: 4401 Dayton-Xenia Rd., Dayton; Ohio 45432-1894
Phone: 937/255-9835
Fax: 937/656-7292
E-mail: triplicane.parthasarathy@wpafb.af.mil